

Multivitamin Use Among Non-Pregnant Females of Childbearing Age in the Western North Carolina Multivitamin Distribution Program

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Abstract

Background: Daily consumption of 400 mcg of folic acid prior to conception and throughout the first trimester of pregnancy reduces the risk of neural tube defects (NTDs) by 50%-80%. A daily multivitamin with folic acid can ensure that females receive the recommended amount of folic acid during childbearing years.

Objective: The purpose of this study was to determine if vitamin consumption is influenced by providing a free bottle of multivitamins to non-pregnant women of childbearing age during a face-to-face interaction with a health care provider in health departments.

Methods: An eight-question survey was given to a sample of women who had received a free bottle of multivitamins. Vitamin consumption behavior prior to the intervention was compared to current usage at the time of the survey.

Results: Twenty-five percent of all survey respondents reported taking a daily multivitamin or folic acid tablet before the intervention. Fifty-three percent reported taking a daily multivitamin 8-10 months later, a greater than two-fold increase (PR=2.1). Latino women reported the greatest increase in daily multivitamin intake, from 21% to 70% (PR=3.3).

Limitations: The results may be difficult to extrapolate to the general population as the survey population differs from the general population. Prior vitamin use was determined by patient recall. The intervention occurred simultaneously with a multifaceted, public folic acid campaign.

Conclusions: Eight to ten months after receiving a free three-month supply of multivitamins during a face-to-face interaction with a health care provider, the number of participants reporting daily use increased significantly.

Keywords: folic acid; vitamin; women's health; preventive medicine; neural tube defects

Neural tube defects (NTDs), which include anencephaly and spina bifida, are serious birth defects of the brain and spine. Daily consumption of 400 mcg of folic acid prior to conception and throughout the first trimester of pregnancy reduces the risk of NTDs by 50%-80%.¹⁻³ In 1992 the US Public Health Service issued a recommendation that all females of childbearing age consume 400 mcg of folic acid daily.² This recommendation was recently reinforced by the US Preventive Services Task Force, which issued a Grade A recommendation

that health care providers offer or provide counseling to their patients encouraging folic acid consumption.⁴

Following mandatory implementation of the US folic acid fortification of grains program in January 1998, the prevalence of spina bifida in the US dropped by 22.9%.⁵ During roughly the same time period, the spina bifida prevalence declined 25.6% in North Carolina overall and by 61.2% in the western perinatal care region.^a In more recent years, the rate of decline in NTDs has been much less pronounced both in the US and in North Carolina.⁶

a North Carolina Birth Defects Monitoring Program, unpublished data, 2009

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While fortification of grain products has been shown to increase folate levels by 100mcg/day, the proportion of women ages 15-44 obtaining 400 mcg of folate daily still remains low (23%-33%).⁷ Although a daily multivitamin with folic acid can ensure that females receive the recommended amount of folic acid during childbearing years, only 37% of non-pregnant women ages 18-45 take a vitamin containing folic acid daily.⁸ Women in certain groups are even less likely to consume daily multivitamins, including young women ages 18-24, women with a high school education or less, women whose annual household income is less than \$25,000,^{8,9} and Latino women.⁸⁻¹⁰

The purpose of this study was to determine if vitamin consumption is influenced by providing a free bottle of multivitamins to non-pregnant women of childbearing age during a face-to-face interaction with a health care provider in a health department setting.

Twenty-four local county health departments in Western North Carolina have participated in a multivitamin distribution program since 2003. These are appropriate locations to study the effects of this intervention for several reasons: (1) health department clients match the profile of women who are less likely to consume multivitamins, (2) health departments offer comparable infrastructures for evaluation purposes, and (3) health departments serve a growing number of Latino women, who have a two-fold increased risk of having NTD-affected pregnancies as compared to non-Latino whites and African Americans.⁹

Methods

In each of the 24 participating health departments, non-pregnant females of childbearing age received a free 100-count bottle of multivitamins containing 400 mcg of folic acid from a health care provider (usually a nurse). The encounter included verbal counseling and the provision of written materials, such as a brochure, explaining the importance of folic acid. The client was also told that when she ran out of multivitamins, she could return to the health department for another free bottle.

The Institutional Review Board of Mission Hospitals reviewed the study protocol and determined it to be exempt from the requirement for IRB approval as allowed under 45 CFR 46.101 (b) exemption #2. Vitamin recipients signed a consent form granting release of their contact information for use in this study.

Between the months of October 2004 and December 2004 a proportional-to-size sampling design gathered 3,500 consent forms from the health departments. Of these, 14% (500 clients) were randomly chosen to make up the study sample.

Eight to ten months after receiving a free bottle of multivitamins, each one of the randomly selected participants received a phone call and was given an eight-question survey to measure their vitamin consumption behavior and folic acid knowledge (see Table 1, page 388). All respondents who had indicated Latino/Hispanic ethnicity on the consent form were contacted by a bilingual interviewer. If the individuals could not be reached after six phone attempts a written survey was mailed.

The primary outcome measure was the change in the self-reported use of multivitamins as determined by the question, "Which answer best describes how often you *currently* take a multivitamin or folic acid tablet of any kind?" The response was compared to the question, "Were you already taking a daily multivitamin or folic acid tablet before you were given your first free bottle?"

Prevalence ratios (PRs) were calculated to compare the proportion of women who were taking a daily multivitamin after the intervention versus before. A PR > 1.0 would indicate an increase in multivitamin intake post intervention, whereas a PR of < 1.0 would reflect a decrease in consumption. McNemar's test for matched pairs was used to calculate p-values to determine whether the change in multivitamin intake was statistically significant.¹¹ All statistical analyses were performed using SAS version 9.1.

Results

The characteristics of the sample group are described in Table 2 (page 389). The characteristics of the original group of 3,500 women were not recorded, but the sample group has demographic characteristics similar to other females of childbearing age who receive services at the 24 county health departments included in the vitamin distribution program (see Table 3, page 389).

Of the 500 clients in the sample, 322 completed the survey for a response rate of 64.4%. Of this number, 278 (86.3%) women were surveyed by phone and 44 (13.7%) completed the written survey and returned it by mail. Responses from both groups were similar. A summary of responses to all questions is shown in Table 1. In this paper, the only results described are the changes in vitamin consumption behavior.

Twenty-five percent of all survey respondents reported taking a daily multivitamin or folic acid tablet before the intervention, while 53% reported taking a daily multivitamin 8-10 months later, a greater than two-fold increase (PR=2.1, $p < 0.001$). The increase was highest in the youngest age group (PR=2.3, $p < 0.001$) and lowest in the older group (PR=1.8, $p=0.012$) (see Table 4, page 389).

Among the different ethnic groups, Latino women reported the greatest increase in daily multivitamin intake, with more than three times as many taking a vitamin after the intervention as compared to before, increasing from 21.4% to 70.2% (PR=3.3, $p < 0.001$). Among non-Latino white women, consumption increased from 26.9% to 46.1% (PR=1.7, $p < 0.001$), and for non-Latino African American women consumption increased from 25.0% to 54.2% (PR=2.2, $p=0.035$). All of these changes were statistically significant at the $\alpha=0.05$ level of significance.

Discussion

Multivitamin consumption more than doubled among survey respondents after the intervention, and the 53% of respondents who reported taking a daily multivitamin after the intervention was also much higher than the 37% of non-

Table 1.
Survey Questions and Responses

Question	Number (%)
1. Were you already taking a daily multivitamin or folic acid tablet before you were given your first free bottle?	n=322
Yes	82 (25%)
No	240 (75%)
2. When you were given your multivitamins, were you also given a brochure or some written information about folic acid?	n=322
Yes	243 (75%)
No	47 (15%)
I'm not sure, I don't remember	32 (10%)
3. Why should women like you take folic acid? (only one answer, please)	n=322
It makes strong bones	50 (16%)
It prevents certain birth defects	209 (65%)
It lowers cholesterol	0 (0%)
It prevents morning sickness	3 (1%)
I don't know	58 (18%)
No response	2 (< 1%)
4. Remembering the first free bottle of vitamins you got, did you finish the bottle?	n=322
Yes	200 (62%)
No	109 (34%)
I don't remember	13 (4%)
5. Which answer best describes how often you <i>currently</i> take a multivitamin or folic acid tablet of any kind?	n=322
Usually every day (Go to question # 7)	172 (53%)
5-6 days a week (Go to question # 7)	29 (9%)
1-4 days a week (Go to question # 6)	63 (20%)
Never (Go to question # 6)	58 (18%)
6. Which answer best describes the reason you don't take a multivitamin or folic acid tablet regularly? (only one answer, please) (Skip questions 7 & 8)	n=121
I forget to take them	65 (54%)
They upset my stomach	13 (11%)
I don't like the taste	4 (3%)
I don't think I need vitamins	0 (0%)
I never got another bottle	11 (9%)
No real reason, I just don't	17 (14%)
Some other reason	11 (9%)
7. Which of the following is the most important reason you, personally, take a multivitamin or folic acid tablet? (only one answer, please)	n=201
It's good for my health	95 (47%)
It's good for my future baby(ies)	69 (34%)
It's easy to get them at the clinic or health department	0 (0%)
I don't always eat well	16 (8%)
The doctor or nurse told me to	14 (7%)
Some other reason	7 (3%)
8. Store brand vitamins sell for \$3-\$4 for a three-month supply. When there are no more free vitamins, how likely is it that you'll buy your own?	n=201
Not very likely	32 (16%)
Likely	85 (43%)
Very likely	83 (42%)
No response	1 (< 1%)
Cross analysis of question 4 with question 5:	n=200
Of the respondents who finished the first free bottle of vitamins how many now take vitamins at least five days per week?	161 (81%)

pregnant women taking a daily multivitamin in a national study conducted at the same time.⁸

The increase in multivitamin consumption among Latino women is particularly significant considering their high NTD rates and low vitamin-taking behavior rates. In addition, the intervention was particularly effective with women younger than 25 (the age group shown least likely to take a daily vitamin before the intervention).

This substantial increase in vitamin consumption among all groups may be partially explained by the one-on-one interaction with a health care provider. The Gallup Survey results between 2005-2007 show that 86%-89% of women who do not take a daily multivitamin state they would likely do so if advised by their health care provider.⁸ Among Latino women this number has been reported to be as high as 99%.¹² Another factor that may contribute to the findings is the design of the intervention itself. Providing a free, three-month supply of vitamins simultaneously with face-to-face health care provider counseling may be the ideal tool to move individuals from knowledge to action and allow women to change their behavior immediately. Many potential barriers to behavior change are eliminated such as traveling to a store, finding the "correct" bottle of vitamins, and having the funds and the motivation to purchase them.

Limitations

There were some limitations to this study. The results may be difficult to extrapolate to other populations as the demographics of those who did not respond to the survey as well as the demographics of the original consented group are unknown. In addition, health department clients fit the criteria of an individual least likely to take a daily multivitamin and thus presented a challenging target; however, they may differ from the general population with regard to how amenable they are to this type of intervention. It is unclear whether such an intervention would have similar results in a private health care setting.

Table 2.
Demographics of Survey Participants

	Number	Percentage
Race		
White	193	60.3%
Latino/Hispanic	85	26.6%
African American	24	7.5%
American Indian	9	2.8%
Other/Unknown	11	3.4%
Age		
< 25	163	51.6%
25-34	110	34.8%
> 34	43	13.6%
No response	6	1.9%

Information was collected between 8-10 months retrospectively, so patient recall regarding vitamin use prior to the intervention may have been inaccurate. If recall error was not related to current multivitamin usage then the prevalence ratios would likely be biased toward the null. Although the survey began with "We're learning useful things from ALL the women who complete the survey even those who have decided NOT to take the vitamins..." some participants may have responded favorably to the questions to please the interviewer (social desirability bias). This may have inflated the percentage of women reporting that they took a daily multivitamin after the intervention. However, written responses for current daily intake were similar to responses given on the verbal survey (52% vs. 53%, respectively), suggesting that social desirability bias was probably not a significant factor.

In addition, during the study period the 24 counties were also receiving a folic acid education campaign which included

Table 3.
Demographics of 24 North Carolina Western County Health Department Patients^a

	Number	Percentage
Race^b		
White	14,095	69.1%
Latino/Hispanic	4,169	20.4%
African American	1,708	8.4%
American Indian	41	0.2%
Other/Unknown	378	1.9%
Age^c		
< 25	12,123	57.8%
25-34	6,686	31.9%
> 34	2,162	10.3%

a NC Health Services Information System, HBS085, written communication, Bernie Operario, March 15, 2009.

b Three year (2006-2008) average unduplicated family planning female patients.

c 2008 unduplicated family planning patients by age groups.

media, community outreach, and educational visits to health care providers. The effect of this campaign on the vitamin-taking behavior of participants is unknown, although likely to be synergistic. Finally, it is not clear whether these short-term changes in vitamin use are predictive of a longer-term change in behavior. Further studies of long-term vitamin use are needed.

Conclusion

Results after the intervention demonstrate a significant increase in daily consumption of multivitamins among program

Table 4.
Reported Daily Multivitamin Intake Before and After Participation in the Western North Carolina Multivitamin Distribution Program

Demographic	Number (%) Using Before Program	Number (%) Using Every Day After Program	Prevalence (after vs. before)	p-value ^a
Group				
All subjects	82 (25.5)	172 (53.4)	2.1	< 0.001
Age group				
< 25	38 (23.3)	86 (52.8)	2.3	< 0.001
25-34	30 (27.3)	60 (54.6)	2.0	< 0.001
> 34	12 (27.9)	22 (51.2)	1.8	0.012
Missing	2	4	-	-
Race/Ethnicity				
White, non-Latino	52 (26.9)	89 (46.1)	1.7	< 0.001
African American, non-Latino	6 (25.0)	13 (54.2)	2.2	0.035
Latino	18 (21.4)	59 (70.2)	3.3	< 0.001
Other/not stated	6 (28.6)	11 (52.4)	1.8	0.059

a Based on McNemar's test for matched-pairs.

participants. The largest increases in daily vitamin intake were found among the two groups most likely to be affected by NTDs and least likely to take multivitamins: Latinos and young women.⁷ Significant behavior change was accomplished with a relatively inexpensive tool—a three-month supply of multivitamins costing only \$1.15 per bottle.

The North Carolina Birth Defects Monitoring Program will continue to monitor NTD trends in the state to help determine whether efforts such as the multivitamin distribution program and other public health folic acid interventions are having the desired effect on reducing the prevalence of birth defects. To help reduce overall NTD rates, as well as the disparity in NTD prevalence among racial/ethnic groups, public health programs should consider providing free multivitamins and folic acid education during a face-to-face interaction with a health care professional. **NCMJ**

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Author's note: On August 7, 2009 the North Carolina General Assembly passed SB374/HB523 which provides funding for the statewide distribution of multivitamins with folic acid to low-income women of childbearing age through the health departments and other safety net providers. The information and data to support the introduction of this bill was provided to Senator William Purcell in November of 2008 in a joint meeting of the Senator, representatives of the North Carolina March of Dimes, and the North Carolina Folic Acid Council. Data presented was compiled by the North Carolina Birth Defects Monitoring Program.

Update: On Monday, November 16, 2009, a notice was sent to all Health Directors and Safety Net Providers stating that funds to purchase multivitamins were no longer available. These funds had become a part of the Division of Public Health's 5% reduction as required by the governor's executive order.

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